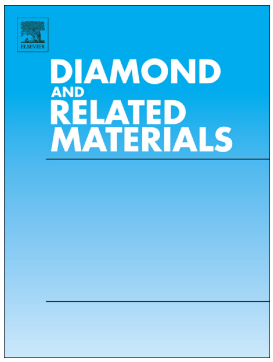

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PII: S0925-9635(18)30480-1
DOI: doi:10.1016/j.diamond.2018.09.017
Reference: DIAMAT 7206

To appear in: *Diamond & Related Materials*

Received date: 6 July 2018
Revised date: 18 August 2018
Accepted date: 12 September 2018

Please cite this article as: Jun-Xiang Xiang, Ning Luo, Tao Shen, Han-Liang Liang, Hong-Wen Jing, Zhan-Guo Ma , Rapid synthesis of carbon/graphite encapsulated iron-based composite nanoparticles by a gaseous-liquid detonation. Diamat (2018), doi:10.1016/j.diamond.2018.09.017

Rapid synthesis of carbon/graphite encapsulated iron-based composite nanoparticles by a gaseous-liquid detonation

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Abstract: In this paper, the gaseous mixture (CH_4, C_2H_2, H_2 and O_2) and ferrocene were used as raw materials to rapidly synthesize core-shell structure carbon/graphite encapsulated iron-based nanoparticles under high-temperatures and high-pressure environment generated by gaseous-liquid detonation. The obtained black powders were characterized by X-ray diffraction (XRD), transmission electron microscopy (TEM) with selected area electron diffraction (SAED) and Raman spectroscopy. The results indicated that the uniformly sized (10-50nm) iron-based core-shell structural composite nanoparticles were effectively synthesized by adjusting the mole ratios of mixture gaseous. In addition, the growth mechanism of carbon/graphite encapsulated metal nanoparticles was also discussed based on the ZND model theory.

Keywords: gaseous-liquid detonation, carbon/graphite, core-shell structure, synthesis, formation mechanism

1. Introduction

In modern nanomaterial science, the core-shell structural carbon/graphite-encapsulated metal nanoparticles (C/GEMNPs) are one of the most interesting composite materials, which outer protective shells are composed of amorphous carbon/graphite coating layers and the inner core is metal, metallic oxides

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